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ABSTRACT

This brief description of the development of competency-based teacher education (CBTE) programs at the University of Toledo emphasizes the analysis of the kinds of competencies in educational technology most needed by preservice teachers and the interdisciplinary nature of the analysis. The two appendices which form the major part of the paper include a collection of competencies currently "in force" in the CBTE programs at the University of Toledo, and a set of competencies grouped by functions in the domain of educational technology. These competencies-by-function form seven clusters--theories of learning and instruction, systematic instructional planning and evaluation, information search strategies, evaluation and selection of instructional media, production of instructional materials, use of alternative instructional media, and understanding and operating audiovisual equipment. A 23-item bibliography is attached. (MER)

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Teacher Education Redesign: Competencies in Educational Technology

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a paper prepared for the
Annual Conference
of the
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Teacher Education Redesign: Competencies in Educational Technology

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The advent of the Ohio Standards for Colleges or Universities Preparing Teachers brings the potential of an era of increased commitment and support for professional in learning resources, instructional design, and educational technology as well as presenting an improved foundation for teacher education. At the University of Toledo, the Department of Educational Technology in conjunction with the Carver Teacher Education Center has played an important - perhaps vital - role in the design and implementation of the Competency-Based Teacher Education (CBTE) programs. In the process, an analysis of the kinds of competencies in educational technology most relevant to preservice teachers has taken place. This analysis has not been occasional or fitfull. Instead, this analysis has been nearly continuous and almost always done with programatic interests foremost in mind. Furthermore, this analysis has not been the province of the faculty of the Educational Technology Department. Indeed, the efforts of faculty from across the College of Education and from other University sources - especially from staff at the Carlson Library - have been considerable.

Two appendices are attached. The first is a collection of competencies currently "in force" in the University of Toledo's CBTE programs. The second is a set of competencies grouped by Functions in the Domain of Educational Technology (Silber, 1971). Those competencies-by-function might be compared to the seven clusters - note: they are functions too - in the first appendix. The seven clusters in evidence in the Toledo CBTE programs are as follows:

theories of learning and instruction
systematic instructional planning and evaluation
information search strategies
evaluation and selection of instructional media
production of instructional materials
(with an emphasis on visual instructional materials)
use of alternative instructional media
understanding and operating audiovisual equipment

Due to limitation in staffing in the Department of Educational Technology, some of the competencies listed in Appendix A are "taught" by faculty from other Departments. Indeed, faculty from Educational Psychology, Elementary Education, Secondary Education, Carlson Library, and others add credence to the objectives and competencies identified. The sets of modules used in the CBTE programs provide much more detail about how instruction functions under a CBTE framework and make clear the full array of competencies developed in the preservice teacher education program.

An important consideration in analysing the Ohio Standards and reviewing the competencies being developed/implemented/evaluated for preservice teachers is that these competencies present great implications for the continuing professional development of teachers and all educators in schools. It is certainly appropriate for members of the Ohio Educational Library Media Association to begin the work of integrating the redesign efforts in preservice teacher education into the inservice education of teachers and others already employed in schools. This may be the first real opportunity in the State to develop a truly coherent teacher education development program that covers the entire spectrum - from beginning teacher education student to established veteran. In this context, all professionals in OELMA have much to gain from the increased interest in instructional media and educational technology and the kinds of learning resources programs that these areas of study represent.

Appendix A

Educational Technology Competencies for Teachers in the form of Module Objectives in the Competency-Based Teacher Education Program at the University of Toledo

Theories of learning and instruction

C. Given ten performance objectives, the pre-service elementary teacher will name the type of learning (Gagne) and level of behavior (Bloom) implied in each objective. The minimum competency level is deemed to be 8 correct.

A. Given access to materials related to Elementary Mathematics curricula and instructional development, each elementary pre-service teacher will construct three simple learning hierarchies which meet the criteria specified in Supplement 1 - Criterion Checklist for Learning Hierarchies.

C. Having completed the required readings you should be able to explain how learning occurs within the following group sizes: N=1, N=2-20, N=20-40 & N>40. Satisfactory completion requires that the student describe each situation in terms of learning theory.

A. To understand the various components of instruction, their interrelationships, and the functions that these components serve for planning learning systems.

Systematic instructional planning and evaluation

A. Given a list of 7 statements representing behavioral and non-behavioral learning outcomes, each elementary preservice teacher will indicate, in writing, whether each statement is a behavioral or a non-behavioral statement with no more than one error.

B. Given a set of 7 behaviorally stated objectives representing the cognitive, affective, and psychomotor domains, each elementary preservice teacher will indicate, in writing, the domain each objective represents with no more than one error.

C. Given examples of the audience, behavior, condition and degree components of objectives in all three domains, each pre-service elementary student will be able to indicate, in writing, which component each example represents, with no more than one error.

D. Given a set of ten statements each describing an instructional outcome in one of the three domains, each elementary pre-service teacher will lable, in writing, whether the statement is adequate as to audience, behavior, condition, and degree components with no more than one error.

E. Given a goal in the cognitive domain of learning, each elementary pre-service teacher will write 2 behaviorally stated objectives for the goal that are revelant and would have no "inadequates" on any of the criteria defined by the Criterion Checklist for Evaluation of ABCD objectives - Cognitive Domain.

F. Given a goal in the affective domain of learning, each elementary pre-service teacher will write 2 behaviorally stated objectives for the goal that are relevant and would have no "inadequates" on any of the criteria defined by the Criterion Checklist for Evaluation of ABCD objectives - Affective Domain.

G. Given a goal in the psychomotor domain of learning, each elementary pre-service teacher will write 2 behaviorally stated objectives for the goal that are relevant and would have no "inadequates" on any of the criteria defined by the Criterion Checklist for Evaluation of ABCD objectives - Psychomotor Domain.

B. Given a goal appropriate for elementary school pupils, each pre-service teacher will write one original performance objective at the Comprehension level, and [illegible] original performance objectives above the comprehension level of Bloom's Taxonomy. In addition, to being at the specified level of behavior, each objective must meet the criteria specified in Supplement 1 in the module - Writing Performance Objectives.

V. Instructional Objectives:

1. The student will be able to write concepts, goals, and instructional objectives, appropriate learning activities, and evaluation items that match the skills as stated by the objectives. The student will demonstrate the related skills in curriculum organization of matching objectives with Bloom's taxonomy, assessing the appropriateness of instruction by evaluating student progress using given diagnostic and assessment techniques.

Performance:
(objectives A-D related to General Objective 1)

A. The student will write appropriate generalizations, concepts, sub-concepts, and goals and objectives from a subject matter area of his choice. The objectives must directly relate to the concepts, and generalizations. The objectives must be measurable and organized so that they can be used in planning subsequent appropriate activities.

B. The student will write appropriate analogous and equivalent activities for a given set of objectives.

1. General Objectives:

   A. Each student will be able to plan a unit of instruction which meets all established criteria.

   B. Each student will be able to implement the unit plan in ways that meet all of the established criteria.

   C. Each student will be able to analyse the unit based on collected data and then redesign those aspects which need improvement, according to the established criteria.

2. Performance Objectives:

   A. Each student will be able to design a unit plan which includes the following components and meets the criteria established for those components (see Unit Planning Checklist):

      Rationale and Goal Statements
      Behavioral Objectives
      Concept Statement
      Assessment (Pre- and Post-) of Pupil Learning
      Evaluation of the Instructional System

   B. Each student will be able to design daily lesson plans which are consistent with the overall unit plan and with module requirements for lesson plans in Inquiry, Questioning, and Concepts.

   C. Each student will be able to prepare/select instructional materials that are consistent with the daily lesson plans and the overall unit plan (see also Module 3, Basics of Preparing Visual Instructional Materials, and Module 2, Selection and Utilization of Instructional Media).

   D. Each student will be able to implement daily lesson plans accounting for the following components and which meet the criteria established for those components (see Unit Implementation Checklist):

      Rationale, Goals, and Objectives
      Preassessment of Pupil Learning
      Instructional Strategies for Learning
      Postassessment of Pupils Learning

   G. Each student will be able to function as a full, collaborating member of an instructional team in the planning, implementating evaluation, and revision of an instructional unit according to the criteria in the Team Member Checklist and Personal and Professional Fitness Checklist.

A. Given a concept area appropraite to an elementary mathematics program, each elementary pre-service teacher will design and write a unit plan of instruction which meets minimum level of acceptability as specified by the Criterion Checklist-Instructional Units.

A. Given examples of module components and a list of possible labels, each elementary preservice teacher will match the component with its correct label such that 9 of 10 examples are correct.

B. Given a random list of module components, each elementary pre-service teacher will reorder the list such that all components are correctly sequenced in 90% of the instances presented.

C. Without the use of any resource, each elementary preservice teacher will write at least one statement which would defend any of 3 randomly selected components common to modules by explaining their contribution toward increasing the effectiveness of the instructional module. To be done without error.

D. Following the Media Selection Process

For a set of (at least one) objective(s) in the Affective Domain, the student will be able to identify instructional strategies, select appropriate media, justify the selections, organize their use, and describe a plan for evaluating their effectiveness in achieving the objective, according to the format of the Media Selection Process Guide.

B. Given a series of 5 minute vignettes of differing instructional strategies, you will be able to identify correctly the strategy being demonstrated as well as submitting data to support your decisions. Satisfactory completion requires 90% accuracy and a minimum of two examples of data drawn from each vignette to support each decision.

Terminal Performance Objective: Given a topic, idea, or short unit of instruction to be taught to a class in your participating school, you will prepare a written plan of instruction for a sequence of five (one week) or more regularly scheduled classes. Implement the planned instructional program by teaching the class, and conduct a self-evaluation of your teaching and results of the planned instructional program including both the cognitive and affective domain.

Enabling Objective 1: In developing the Comprehensive Instructional Unit, the student will prepare a written plan of instruction for a sequence of five classes (one week) which will include the following:

a) Name of the unit topic or content taught
b) Description of classroom learning environment and student characteristics including potential problems
c) Behavioral objectives
d) Pre-assessment instrument
e) Description of instructional strategies and procedures for each day of instruction
f) Post-assessment instrument

The written plan must be approved by the school cooperating teacher and major methods instructor before the unit is taught.

Enabling Objective 2: The student will implement and teach the planned Comprehensive Instructional Unit and have a minimum of two classroom observations and evaluations by the major methods instructor.

C. Given examples of faulty test items, the student will (1) identify the faulty aspects of the questions, and demonstrate which skill demonstration would most effectively be assessed by:

(a) work-sample procedure, (b) observation procedures (c) paper pencil test procedures

D. Given the specific characteristics of an evaluation problem, the student will (1) supply an interpretation and defense as to whether student learning has been demonstrated, and (2) diagnose the results for their implications for subsequent teacher behavior.

Objective 1: Given a typescript of a typical classroom interaction sequence and training in systematic observation using Flanders Interaction Analysis System (FIAS), you will code the sequence using all 10 of Flanders' categories with 95% accuracy for TC, (AC level: 90% accuracy).

Objective 2: Given an audio recording of a classroom lesson, you will code the lesson and prepare a matrix of interaction tallies and column totals.

Objective 3: Given a sample Flanders matrix from a transcribed lesson, you will interpret the data. Successful completion requires that you analyze and interpret the data according to the guidelines in this module entitled "Interpretation of the Matrix", page 2-9. This response must be prepared in narrative style.

Objective 4: You will be able to describe at least four significant limitations and four advantages of FIAS. Satisfactory completion requires a short essay response not exceeding 200 words.

2. Given an evaluation checklist, each student will evaluate, in a micro/peer teaching setting, each other student's simulation-game implementation.

E. Each student will be able to systematically collect, analyse, and interpret data on the effectiveness and efficiency of the unit according to the criteria in the Unit Implementation Checklist (See "Evaluation of the Instructional System).

F. Each student will be able to make appropriate revisions in the Unit Plan, based on collected data and the criteria in the Unit Planning Checklist.

Enabling Objective 3: The student will conduct a Self-Evaluation of Teaching on at least one class period during implementation of the Comprehensive Instructional Unit and discuss the results obtained with the cooperating teacher and major methods instructor.

Information search strategies

1. The ability to identify the meaning of basic library terms (index, circulation, reference, etc.).
2. The ability to identify from a catalog card the information necessary for a complete bibliographic citation.
1. The ability to locate and to understand the functions of the major facilities (card catalog, serials printout, book stocks, periodicals, etc.), major services (reference, interlibrary loan, etc.), finding aids (signs, directory, etc.), major equipment (photocopiers, etc.), and the reference staff.
2. The ability to locate and obtain books and nonprint materials using the card catalog. This skill includes:
   a. The ability to record and utilize important information in addition to the bibliographic citation from a catalog card.
   b. The ability to use the Library of Congress subject headings.
   c. The ability to utilize library procedures to locate and borrow print and nonprint items.
3. The ability to locate and obtain materials using indexes (periodical, newspaper, essay, etc.). This skill includes:
   a. The ability to record complete bibliographic information from indexes other than the Reader's Guide to Periodical Literature.
   b. The ability to identify and use the tools that must be consulted to find out if the library has the item sought.

4. The ability to find and use the appropriate basic reference tools, (specialized encyclopedias, biographical dictionaries, basic statistical publications, etc.).

6. The ability to plan and implement an efficient and effective search strategy for a college-level research paper.

Possible Level III competence: The ability to identify and use the major reference tools, search strategies, and research techniques common to a given field of study.

Evaluation and selection of instructional media

1. General Objectives:

   A. Each student will be able to select media alternatives that best complement selected instructional strategies in meeting instructional objectives.

   B. Each student will be able to correctly implement (utilize) instructional media (hardware and "courseware") in an educational environment.

2. Performance Objectives:

   A. Identifying pertinent Media-Related Questions

   Given a set of behavioral objectives with relevant instructional strategies for achieving those objectives, the student will be able to identify the Media-Related Questions most pertinent to the strategies with at least 80% accuracy.

   B. Matching Media to advantages

   Given a list of various instructional media and a list of potential advantages of media, the student will be able to match the media to their respective advantages, without error, as per the Unique Advantages of Instructional Media checklist.

   C. Selecting potential Media for instruction

   Given partially completed samples of the Media Selection Process Guide, the student will be able to select, without error, the most appropriate Potential Medium to meet the stated objective(s), etc., as gauged by the Unique Advantages of Instructional Media checklist.

E. Identifying implementation criteria

Given a list of various instructional media, the student will be able to list, from memory and with less than 10% error, the necessary and appropriate criteria for judging the utilization of each media type, as gauged by the Criteria for Appropriate Use of Instructional Media and the Media Utilization Checklist.

Terminal Performance Objective: Given a TPO and three EO's in his major subject area with each objective matched to a specified audience size, each student will select the most appropriate instructional medium (media) for each objective. The type of media (e.g., filmstrip, record, video tape) selected for each objective must be consistent with the designated guidelines for matching media type with teaching strategies, audience size, unique advantages, and practical applications. The specific commercially available instructional medium, the selection of the medium (i.e., the specific audio tape, film, slide set, etc.) for each objective must be based upon the "Criterion Checklist for Evaluating Media." If no commercially available medium fits the needs of a determined objective and audience, the student will submit a written design for a medium to be produced which adheres to the aforementioned guidelines and checklist.

Production of instructional materials

1. General Objectives:

   A. Each student will be able to assemble and use a list of basic production materials for application to the design and preparation of visual instructional materials.

   B. Each student will be able to identify and use appropriate design and technical criteria for evaluating visual instructional materials.

   C. Each student will be able to identify the requirements of planning the design and production of visual instructional materials.

   D. Each student will be able to perform selected design and production processes for visual materials, in correct sequence, which then result in technically acceptable instructional products.

   E. Each student will be able to apply design and production techniques to the development of selected visual instructional materials for use in lesson presentation(s).

2. Performance Objectives:

   A. Assembling a "basic materials production Kit"

   Given a list of items needed to create a "basic materials production kit" for the design and preparation of visual instructional materials, the student will be able to purchase/collect/make the items and assemble the kit within one week.

B. Identifying relevant product rating criteria

Given a set of sample visual instructional materials and a list of design and technical criteria for evaluating visual instructional materials, the student will be able to identify the criteria that are relevant to evaluating each of the materials, with at least 90% accuracy.

C. Rating design and technical features

Given a set of criteria for evaluating visual instructional materials, the student will be able to rate the design and technical features of the materials according to the criteria. The student must achieve at least 80% concurrence with the ratings of qualified judges.

D. Sequencing design and production activities

Given a scrambled list of design and production activities required to produce a specific instructional product, the student will be able to arrange the steps into their correct order with 100% accuracy.

E. Estimating design and production activity timeframes

Given a set of design and production activities and a list of performance timeframes, the student will be able to identify the correct performance timeframe for each activity with at least 80% accuracy.

F. Producing visual instructional materials to master processes

Given a set of flowcharts describing the materials production techniques listed below and using items from the "basic materials production kit," the student will be able to produce at least one of each of the following materials, according to the technical criteria on the Visual Materials Production Checklist.

1. freehand block lettering
2. transfer lettering
3. stencil lettering
4. primary typewriter lettering
5. enlarging/reducing/distorting visuals
6. mounting visuals
7. laminating visuals
8. producing overhead transparencies
9. producing transparencies with overlays
10. coloring transparencies
11. spirit duplicating
12. using cloth backing (optional)

G. Producing instructional materials to facilitate instruction/learning

Having developed a set of objectives for a series of lessons, the student will be able to design and produce a set of visual instructional materials, as appropriate, for at least 3 instructional objectives. The resulting materials must meet the design and technical criteria listed in the Instructional Product Rating Instrument.

Use of alternative instructional media

Terminal Performance Objective: Using the post-assessment results from his simulation-game implementation and the players' written evaluation recommendations, each student will designate, in writing, revisions that would facilitate the players' attainment of the stated behavioral objective.

Enabling Objectives:

1. In a micro-teaching setting, each student will be able to direct his peers through the playing and debriefing (if appropriate) of his own developed simulation-game, to include a post-assessment of the players to determine whether the simulation-game was sucessful in enabling each player to meet the specified behavioral objective. The game play, debriefing, and post-assessment will be accomplished within 30-45 minutes. The game developer must assume the role of manager of instruction (rather than teacher), allowing the simulation-game to teach (mediated instruction).

3. Given the instructions for The Game Game, each student will be able to design and produce an original simulation game which meets the criteria specified in The Game Game.

4. Given a list of the four types of behavioral objectives facilitated by simulation-gaming and a list of simulation-game components, each student will be able to match the essential components to the types of objectives without error.

5. Given examples of simulation-games, some of which have missing essential components, each student will be able to select all and only the complete examples.

6. Given simulation-game examples and the four behavioral objective classifications, each student will be able to correctly match each example with the appropriate classification without error.

7. Given examples and nonexamples of the following types of behavioral objective classifications appropriate to mediated instruction a la simulation-gaming, each student will be able to select only and all examples for each classification: fact, attitude, process, product.

8. Given a list of simulation-gaming definitions and terms each student will be able to match the definitions with the terms without error.

9. Given brief descriptions of instructional methods using media, each student will correctly label only and all examples of mediated instruction.

10. Without the aid of references, each student will be able to write, in his own words, a definition of mediated instruction. The definition must include all critical attributes specified in the module.

1. General objective:

   A. Given an instructional need, the student should be able to develop an educational simulation/game according to specific criteria.

   B. Given an educational simulation/game and a teaching/learning situation, the student should be able to effectively utilize the product according to specified criteria.

2. Performance Objectives:

   A. Given a set of examples and non-examples, each student will be able to correctly identify the appropriate elements of the utilization process for educational simulation/games with 70% accuracy for the AC level and 80% accuracy for the TC level.

   B. Given a set of gaming materials, a copy of the Game Game, and a copy of "Facilitators Instruction," each student (teamed with 2, 3, or 4 other students) will be able to develop a simulation game designed to facilitate the player's attainment of a stated behavioral objective. The student developed game must meet the classification criteria specified in the "Facilitator's Instructions." The student designed game must be tested in a field situation and an analysis consistent with the attached checklist submitted to the instructor.

   F. Meeting implementation criteria

      For a pre-planned lesson, the student will demonstrate competence in implementing media, as gauged by the Media Utilization Checklist.

Audiovisual equipment operation

A. Given a Bell & Howell 16 mm manual load film projector the learner will be able to, within 6 minutes, project and rewind a 2 minute film adjusting the focus, framer and elevation controls, without error.

B. Given a Bell & Howell 16 mm Auto-load film projector the learner will be able to, within 5 minutes, load, project, and rewind a 2 minute film adjusting the focus, framer, and elevation controls such that the image is suitable for instructional purposes, without error.

C. Given a Kodak Carousel slide projector, within 5 minutes the learner will insert 5 slides in the tray and project a properly oriented image using forward, reverse and focus controls located on the machine and on the remote unit and demonstrate use of "select" button, without error.

D. Given a Wollensak 1500 tape recorder, within 3 minutes the student will thread, rewind, record, and playback 15 seconds of his voice such that the recording is audible and distinct for normal listening, and connect headset, without error.

E. Given a Viewlex V-25 filmstrip projector, within 4 minutes the learner will insert the filmstrip element and project 3 frames using the focus, elevation, framer, and cooling controls and achieving an image of sufficient clarity for instructional use, without error.

F. Given a Viewlex V-25 filmstrip projector, within 4 minutes the learner will insert the slide element and project 3 slides using the focus, elevation, framer, and cooling controls and achieving an image of sufficient clarity to be suitable for instructional use, without error.

G. Given an opaque projector and suitable copy, within 2 minutes the learner will load and project the copy on a screen using the focus, elevation and pointer controls such that it would be suitable for large group presentation, without error.

H. Given an overhead projector and a suitable transparency, within one minute the learner will position transparency and project an image on a screen using the focus and elevation controls such that the image would be suitable for large group viewing, without error.

I. Given a Technicolor 8 mm film loop project within 2 minutes the learner will insert film cartridge, project, focus, frame, elevate, and remove cartridge from projector, without error.

J. Given an open reel helical scan videotape recorder deck and connected moniter, within 5 minutes to thread, playback and rewind the videotape, such that the image on the moniter is suitable for instructional use, without error.

K. Given any of the basic pieces of audiovisual equipment using either light source lamps, or sound lamps, to be able to locate those lamps and explain proper lamp removal and installation procedures without error.

Appendix B

Competencies In Educational Technology For Pre-service Teachers

Arranged By Functions In The "Domain Of Educational Technology"

Adapted From M. C. Ware (1976)

Desigh-Production

Considers background of students in planning for teaching-learning.
Plans a resource unit.
Writes clear behavioral objectives.
Designs and produces individualized units of instruction for various levels of ability.
Demonstrates the ability to design and produce a variety of materials appropriate for facilitating teaching-learning.
Designs and produces materials for program documentation.
Demonstrates the ability to construct teaching games.
Demonstrates a knowledge of economic factors involved in producing materials.

Evaluation-Selection

Demonstrates the ability to evaluate the effectiveness of media use in teaching-learning.
Uses media to evaluate one's own teaching performance.
Selects media that are appropriate to the subject and children's stage of thinking.
Values use of media and materials.

Utilization-Production

Demonstrates proficiency with small and large group instruction.
Uses drama as a medium.
Demonstrates the ability to use a variety of media effectively.
Teaches children to use classroom AV equipment.
Demonstrates proficiency in operating a variety of audio-visual equipment.
Demonstrates the ability to coordinate the use of AV equipment for variety and change of pace in lessons and units.
Uses media to evaluate student progress.
Involves children in media preparation.
Demonstrates the ability to keep up with innovations in hardware and software.

Support-Supply

Demonstrates a system for preparing and storing classroom materials to allow for easy access.
Develops media file appropriate to class interest.

Demonstrates knowledge of commercially available materials in academic areas.
Demonstrates knowledge of community resources available to the school.
Demonstrates the ability to make minor repairs and routine maintenance on classroom AV equipment.
Demonstrates knowledge of sources of software suited for one's specific field and grade level.
Demonstrates the ability to set up individualized learning centers including audiovisual equipment.
Is acquainted with capabilities and limitations of various delivery systems
Demonstrates the ability to communicate with media specialists.
Locates media specialists when assistance is needed.

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